SIXTH PROGRESS REPORT

on

STRESSES AND DEFORMATIONS IN THIN SHELLS OF REVOLUTION

to

National Aeronautics and Space Administration

under

NASA Research Grant NsG-274 Supplement 1

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June 30, 1965

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Introduction

The objective of this investigation continues to be the development of methods of analysis for thin shells of revolution subjected to axisymmetrical loading of high intensity.

Progress during the report period

During the past six months, the following activity associated with the project may be noted:

1. The earlier report, "Edge Disturbances in Axisymmetrical Shells of Revolution," by E. P. Popov and Z. A. Lu has been recast into a paper entitled "Computer Analysis of Axisymmetrically Loaded Shells of Revolution." This paper has been accepted by the International Association for Shell Structures for presentation at the Budapest International Symposium on Shell Structures in Engineering Practice, 31 August to 3 September, 1965. Proceedings of the Conference are scheduled for publication.

2. During the past year, a major effort was carried on to extend the previously developed basic solution for axisymmetrical problems to include additional boundary conditions and dynamic response. Element stiffness matrices are now developed and programmed for circular plates, rings, shallow caps, cones, and cylinders. In addition to generating solutions using lumped masses, a refined solution based on mass matrix taking into account the actual distribution of mass in the structure was formulated. Frequencies associated with axisymmetrical vibrations can now be determined for a number of cases. Work continues on programming response of shells to time-dependent force or acceleration input.

3. A thorough review of literature on possible means of developing solutions for range of loading which exceeds elastic response was made. A limit analysis approach was not pursued because of the inherent limitations of the method. Instead, the more plausible

Prandtl-Reuss law was adopted in a form suitable for numerical work. Development of solutions for small deformations for elastic-plastic material assuming isotropic strain hardening is in progress. Results obtained so far for circular plates are very encouraging.

4. A number of methods of solution for elastic circular plates and shells of revolution involving non-linear response were evaluated. This study is being continued. No definite selection of a desirable approach has been made so far.

Budget

A budgetary statement on this project will be sent separately as soon after as all of the June expenses are reported.